Amendments to the Drawings:

Applicants submit a set of replacement drawings with this Amendment.

REMARKS

In the Office Action, the previously submitted substitute specification has been disproved and objected to. Claims 41-44 and 45-51 are rejected under 35 USC §112, 2nd paragraph. Claims 33, 35-49, and 40-45 are rejected to under 35 USC § 103(a). Claim 34 is objected to, but indicated as being allowable if rewritten in independent form. Claim 10 is allowable over the prior art of record.

Accordingly, a new substitute specification is submitted herewith. Claim 34 has been amended to independent form. Claims 33 and 42-51 have been cancelled. Claims 35-40 have been amended.

For the reasons set forth herein, it is respectfully submitted that Applicants' invention as set forth in claims 35-40 includes features which are not taught or suggested by the cited references, taken in any permissible combination. Reconsideration is, therefore, respectfully requested.

The substitute specification filed 21 August 2008 has been disproved and objections raised. Accordingly, Applicants' submit a new redlined specification and a new substitute specification addressing the issues raised by the Examiner. The new substitute specification numbers each paragraph in consecutive order.

The new substitute specification does not contain new matter. A marked up copy of the original application, which was previously submitted with the prior substitute specification, is resubmitted showing all of the changes made to the original application, which changes appear in the substitute specification.

The Examiner specific objections have been addressed in paragraph 45, 51, 49, 62 and 67.

A new set of replacement drawings are included in this amendment which reflects the changes in Fig. 1.

With respect to the trademark RT/DUROID, in both occurrences this trademark is identified as being a type of substrate. Thus, it is submitted that Applicant has applied the generic terminology for this trademark as requested by the Examiner. With respect to the graphs,

the Examiner has requested further elaboration of the important aspects or features depicted by the curves in the graphs. However, it is respectfully submitted that the graphs shown in the various figures have sufficient description of the important aspect or features depicted by the curves and graphs for one of ordinary skill in the art to clearly understand Applicants invention and description thereof. The scale headings and curve designation list clearly describe the important features of the drafts.

The rejection of claims 41-44 and 45-51 is rendered moot by the cancellation of these claims.

Claims 33, 35-39 and 40-45 are rejected under 35 USC § 103(a) as being unpatentable over either Sullivan or Kirano in view of Hopwood.

Claims 33 and 42-45 have been cancelled. Claims 35-39 have been amended to depend from claim 40. Claim 40 has been amended to more specifically define the features of Applicants' invention.

The Examiner contends that Sullivan and Kirano disclose a one dimensional phase array antenna comprising a plurality of series connected or cascaded phase shift elements defining a plurality of divider ports located between adjacent phase shift elements to which respective antennas are connected. The Examiner notes that an alternating signal applied to Sullivan or Kirano propagates along the series connected phase shift elements, with each phase shift element imparting a desired amount of phase shift to provide a successive phase difference to the propagating signal at each dividing port.

The Examiner acknowledges that the phase array antenna of either Sullivan or Kirano differs from the claimed invention since the phase shift elements do not explicitly disclose first series tunable elements and second tunable elements parallel connected to the respective antennas.

Examiner cites Hopwood for disclosing in Fig. 6 a phase shifter comprising a plurality of series connected or cascaded phase shift elements. Each individual phase shift element further comprises two series connected varactors and a parallel or shunt connected varactor where the two inductors are considered "tunable" by virtue of being designed to a different inductive

reactance and where the varactors are considered tunable by the application of the control voltage to change the capacitance. Examiner also notes that such series connected inductors, by virtue of the designed inductive reactance, would necessarily provide an impedance and version from one end to the other end as known to those of ordinary skill in the art.

The Examiner concludes that it would have been obvious to modify Sullivan or Kirano with Hopwood. The Examiner also contends that the series connection of plural phase shift elements taught by Hopwood would obviously have been compatible with the series connection of generic phase shift elements in either Sullivan or Kirano.

It is respectfully submitted that the cited references fail to teach or suggest Applicants' invention set forth in claims 40 and 35-39. Sullivan lacks any equal power division at the antenna ports as Sullivan discloses only a phase shift circuit coupled between each antenna port. Kirano couples a discrete phase shift circuit and a matching circuit between each antenna port. The phase shift circuits in each Sullivan and Kirano are discrete and separate from any matching circuit employed in either Sullivan or Kirano. Each phase shift circuit in Sullivan and Kirano and each matching circuit in Kirano is made up of a large number of discrete electrical components. Contrary to the Examiners assertion that both Sullivan and Kirano would appear to have a serial feed path with a respective phase shifter which must necessarily function to provide phase shift and power division simultaneously, it is respectfully submitted that both Sullivan and Kirano are silent on any equal power division at each antenna port and simultaneous phase shifting between each port by the use of series impedance and a shunt impedance whereby at resonance, the power is equally divided at each serially connected antenna port and a phase shift is created between each port. Applicants' series, impedance and shunt impedance cooperate to provide both power division and phase shift by uniquely transforming the admittance at each antenna port to its conjugate admittance which creates the equal power division and phase shift between each port.

If, in both Sullivan and Kirano, the phase shifter circuit is eliminated, each antenna would radiate a single frequency thereby rendering both Sullivan and Kirano inoperative as a phased array antenna. In Applicants' invention, removal of either the series impedance or the shunt

impedance renders the entire circuit inoperative for phase shifting and power division as well as an inoperative for use a phased array antenna.

Both Sullivan and Kirano are devoid of any teaching of transforming of the admittance to each antenna port to a conjugate admittance by selection of specific series impedance. Applicants' have uniquely recognized that creating the conjugate admittance at each antenna port of a series connected antenna array can yield equal power division at each antenna port and a phase shift between each port in a single extended resonance circuit which requires a minimal number of components.

Hopwood discloses a quadrature hybrid circuit with a specially designed load circuit 66 intended to linearize the phase shift vs. voltage characteristic of the phase shifter. The Examiner cites Fig. 6 of Hopwood for showing the use of a varactor diode as the voltage variable reactance. However, the circuit of either Fig. 6 or Fig. 4 of Hopwood is but a small part of an overall lumped quadrature hybrid circuit shown in Fig. 5 which contains numerous elements, connections and use of digital processing circuitry.

Hopwood's load circuit does not work in the series fed array designs of Sullivan or Kirano because it is not designed to accommodate antenna impedances in such a tandem structure. When one connects antennas in tandem, the circuit impedance varies along the structure causing mismatch and reflections at the input and arbitrary phase shift along the structure. Hopwood's phase shifters are designed based on constant input and output impedances. To combat impedance variations across a serially fed array into control power distribution to the antennas, hybrid couplers have been used to connect the antennas.

Hopwood does not teach or suggest signal distribution and phase shifting in a single extended residence circuit of serially connected antennas as set forth by the Applicants in the claims. Hopwood shows input port which is connected to a single distribution circuit, and an output port which is connected to the antenna.

If Hopwood's phase shifter were able to be combined with serially fed antenna circuits of Sullivan and Kirano, the resulting combination still lacks any appreciation or feature of selecting a series impedance coupled between each antenna port to transform the admittance at each port to

a conjugate admittance which, in combination, with a shunt impedance automatically provides power distribution at each port and phase shifting between each port.

It is respectfully submitted that, for these reasons, the Examiner has failed to establish a *prima facie* case of obviousness to support a rejection of Applicants' invention based on any permissible combination of Sullivan or Kirano in view of Hopwood. As explained above, Hopwood circuit cannot be simply combined with the serial antennas arrays of Sullivan or Kirano. Further, the cited references lack any use of conjugate admittance created by a serial impedance of a particular magnitude between each antenna port in the serially connected antenna array which provides, with a minimal amount of components, power distribution at each port and a phase shift between each port when the antenna ports are at resonance.

For these reasons, it is respectfully submitted that Applicants' invention as set forth in claim 40, as well as claims 35-39 which depend therefrom, patentably defines over the cited references taken in any permissible combination.

Thus, claims 10, 34 and 35-40 are submitted to be in condition for allowance; a notice of which is respectfully requested.

Entry of this amendment under the provisions of Rule 37 CFR 1.116 is submitted to be warranted and is respectfully requested, even if the Examiner remains of the opinion that Applicants' invention is not patentably distinguishable from the combined cited references.

This After Final Amendment: (1) does not raise new issues which would require further consideration and/or search since the proposed amendments to claim 40, involving the admittance and conjugate admittance between each port, have been contained in previously recited claims which have been previously considered and searched by the Examiner, (2) does not raise the issue of new matter since the proposed amendments have full support in the originally filed application including the specification, claims and drawings, (3) places the application in better form for appeal by materially reducing and/or simplifying the issues for appeal; and/or (4) does not present additional claims and cancelled a number of claims.

This Amendment and remarks could not have been presented earlier since Applicants' believed that the previous Amendment adequately defined Applicants' invention over the cited

references. However, upon reviewing the Examiner's specific remarks and application of each reference to Applicants' claims, it became apparent that the claims would have to be amended to more specifically define the features of Applicants' invention and an expanded explanation supplied to the Examiner to address the Examiner's comments in the final Office Action. This is Applicants' attorney's first opportunity to address the Examiner's rejections based on the specific grounds raised by the Examiner in the final Office Action.

Accordingly, entry of the Amendment under the provisions of Rule 37 CFR 1.116 is submitted to be warranted and is respectfully requested.

Respectfully submitted,

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Date: May 21, 2009
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